

Impact of initialisation on the reliability of decadal predictions

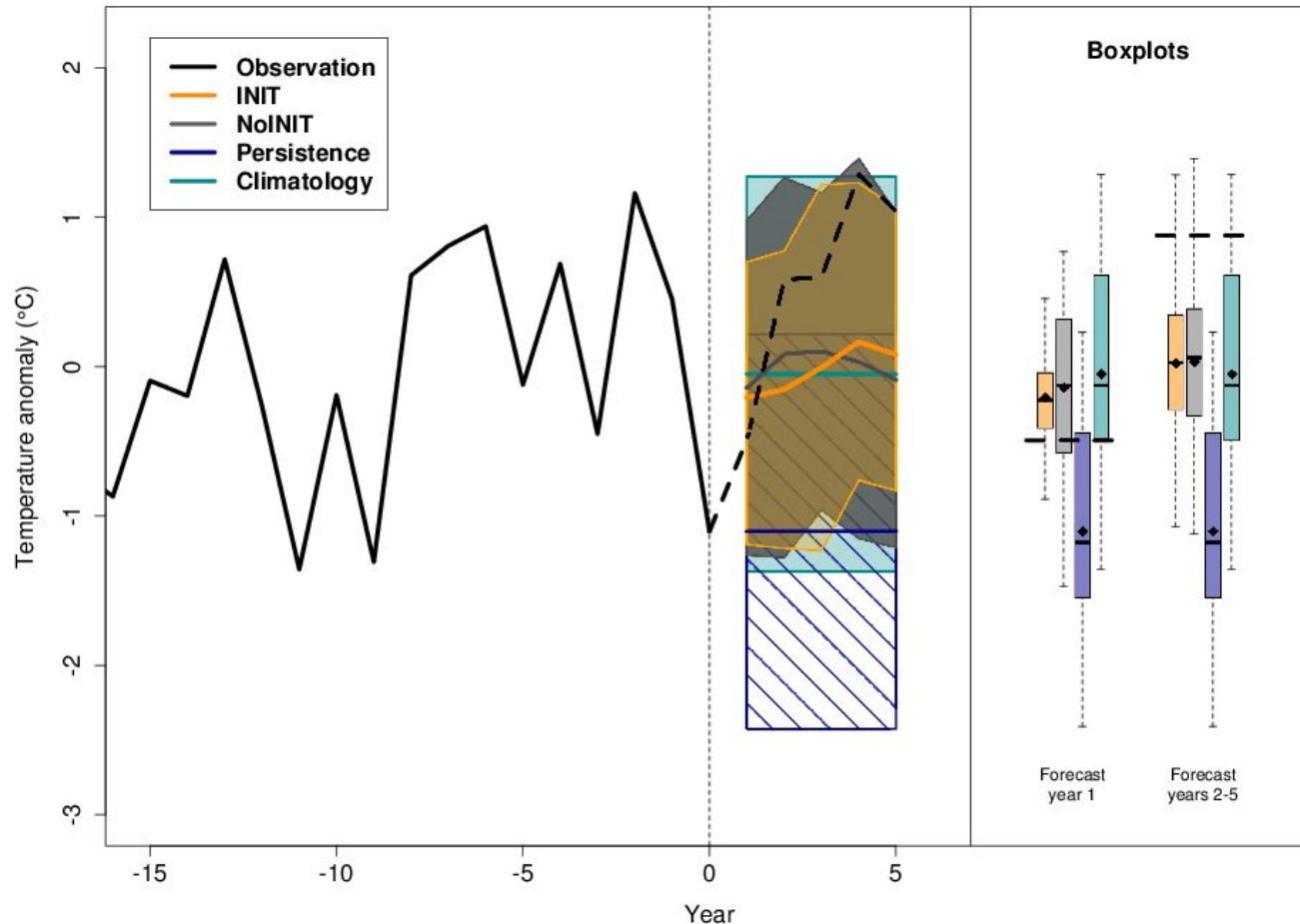
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on Statistical Climatology**
Toulouse, 27 June 2019

Introduction: Initialised decadal predictions (INIT) vs. non-initialised projections (NoINIT)



Methods: Comparison between INIT and NoINIT

Generally done in terms of forecast quality (skill scores)

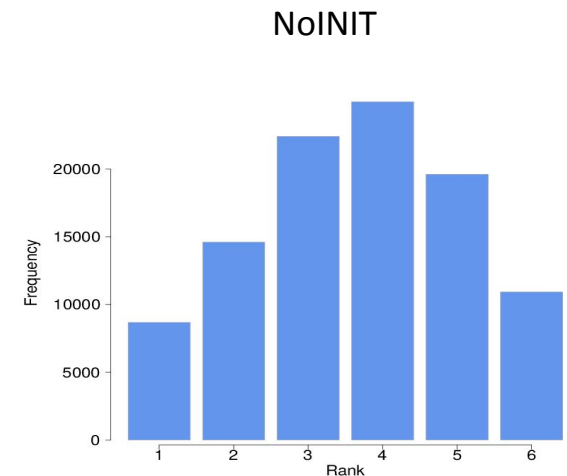
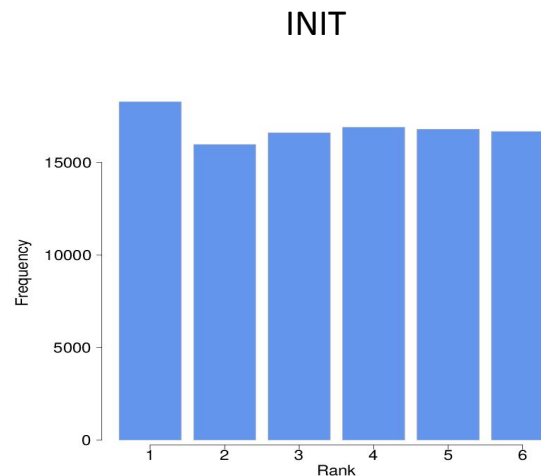
Here: impact of initialisation in terms of **reliability**

= agreement between the predicted probabilities and observed relative frequencies of a given event

Different tools:

- **rank histograms**

Precip, European region
1960-2005, Forecast year 1
EC-Earth 2.3, 5 members
Observations: GPCC v7



Methods: Comparison between INIT and NoINIT

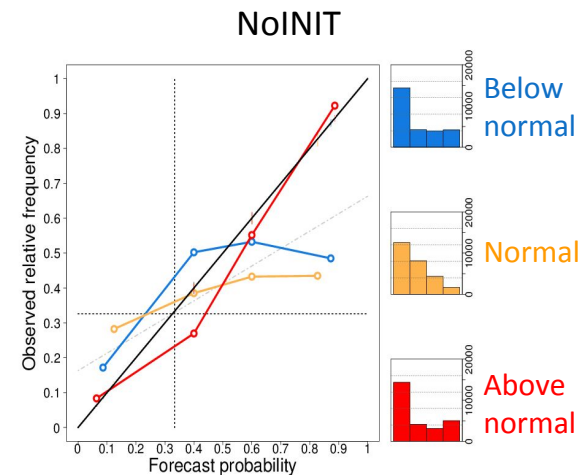
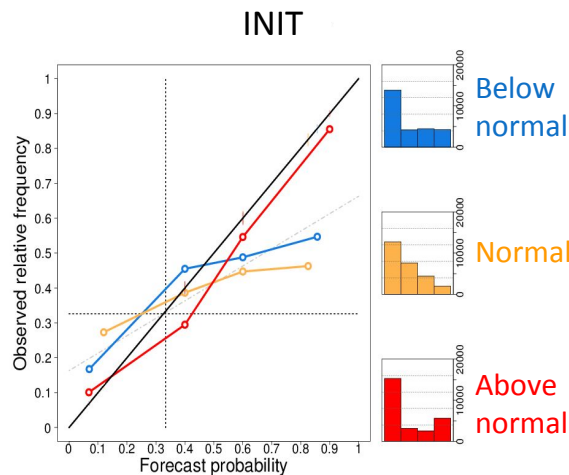
Generally done in terms of forecast quality (skill scores)

Here: impact of initialisation in terms of **reliability**

= agreement between the predicted probabilities and observed relative frequencies of a given event

Different tools:

- rank histograms
- **reliability diagrams**



T, European region

1960-2005, For. years 1-5

EC-Earth 2.3, 5 members

Observations: GISSTEMP

Methods: Comparison between INIT and NoINIT

Generally done in terms of forecast quality (skill scores)

Here: impact of initialisation in terms of **reliability**

= agreement between the predicted probabilities and observed relative frequencies of a given event

Different tools:

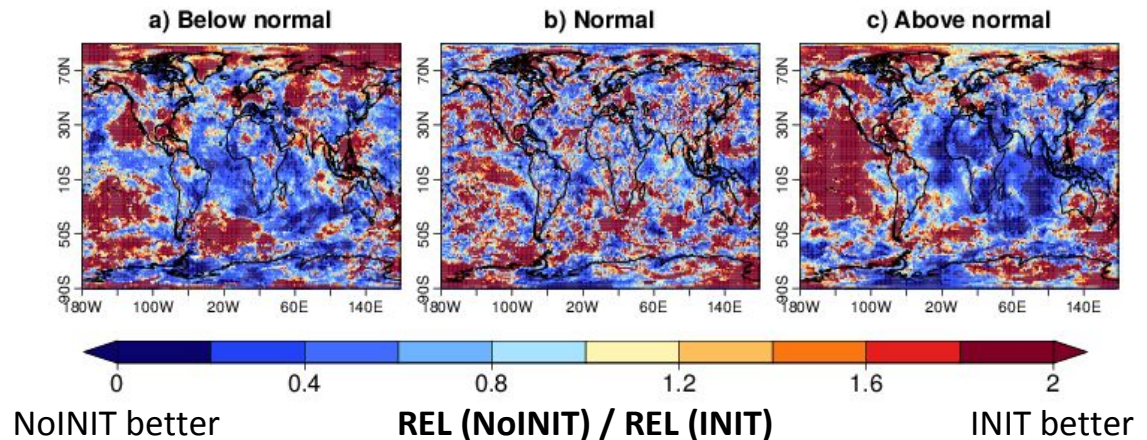
- rank histograms
- reliability diagrams
- **REL from Brier score**

Sea-level pressure

1960-2005, Forecast year 1

EC-Earth 2.3, 5 members

Observations: JRA 55

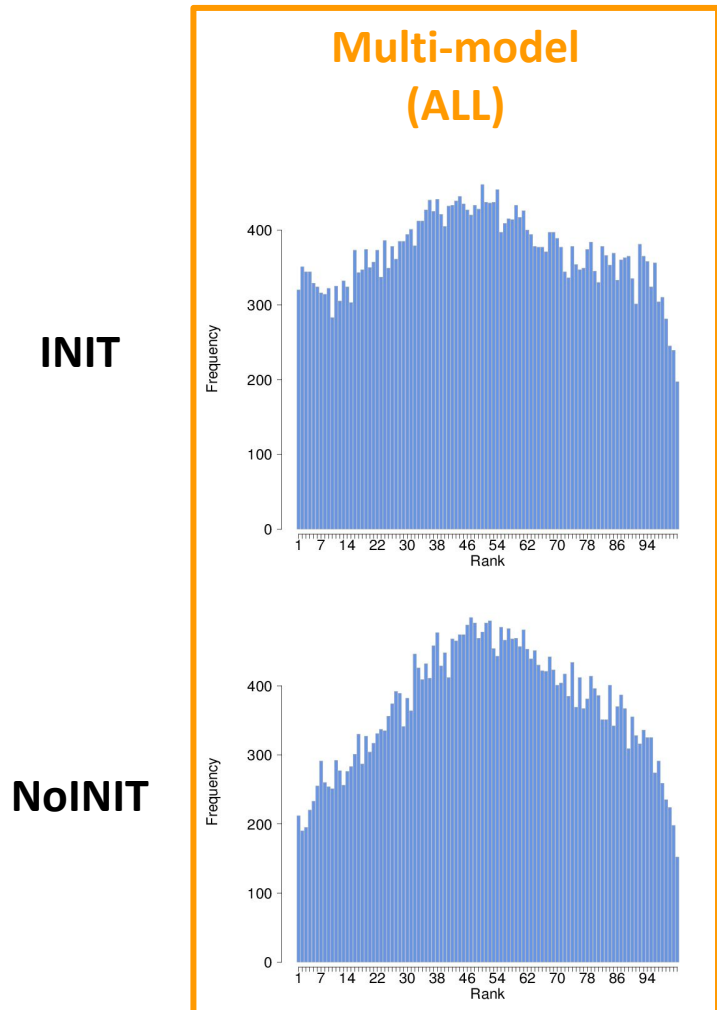


Verfaillie et al., in prep.

Methods: Multi-model ensembles

Project	Centre	Model (version)	INIT ensemble size	NoINIT ensemble size
CMIP5	BCC	BCC-CSM1.1	4	1
CMIP5	CCCMA	CanCM4	10	10
CMIP5	BSC	EC-Earth	5	11
CMIP5	NOAA-GFDL	GFDL-CM2.1	10	10
CMIP5	Met Office	HadCM3 (full field)	10	10
CMIP5	Met Office	HadCM3 (anomaly)	10	10
CMIP5	MIROC	MIROC5	6	3
SPECS	IPSL	IPSL-CM5A-LR	3	4
SPECS	MPI	MPI-ESM-LR (v1)	5	3
SPECS	MPI	MPI-ESM-LR (v2)	3	3
SPECS	MPI	MPI-ESM-MR	5	3
DPLE/LENS	NCAR	CESM1-CAM5	40	40
Multi-model (ALL)			111 (101)	108 (101)
Multi-model (ALL but NCAR DPLE/LENS)			71 (61)	68 (61)

Results: surface T - Europe - f. year 1 - ANNUAL

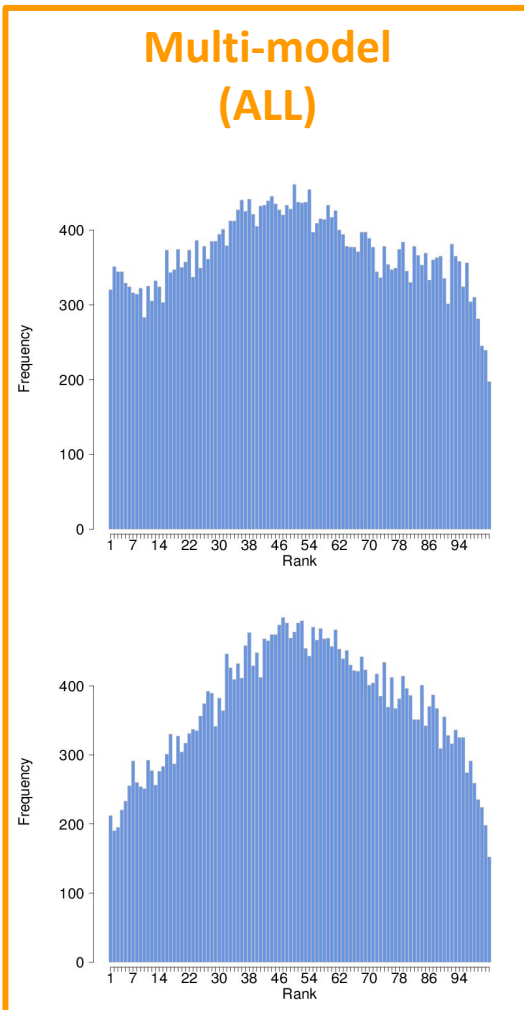


→ INIT more reliable than NoINIT

→ NoINIT overdispersive

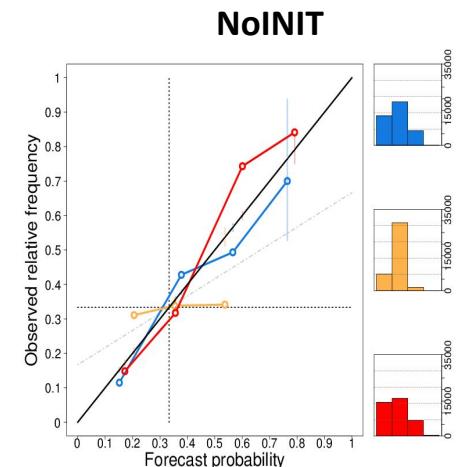
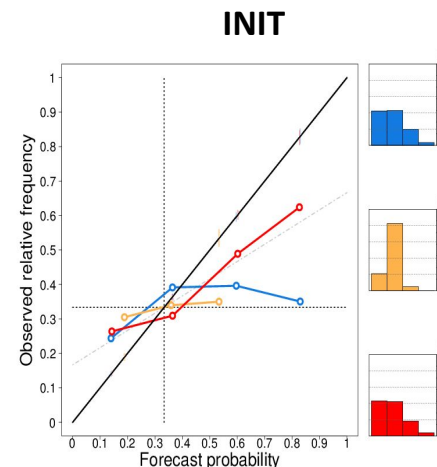
Results: surface T - Europe - f. year 1 - ANNUAL

INIT



NoINIT

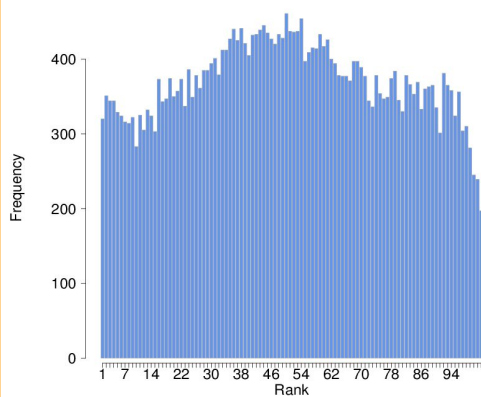
- INIT more reliable than NoINIT
- NoINIT overdispersive
- Different message from reliability diagrams:



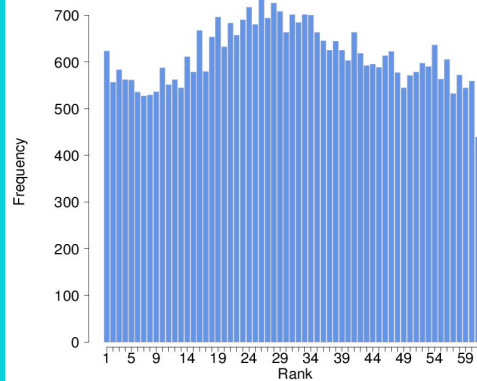
Results: surface T - Europe - f. year 1 - ANNUAL

INIT

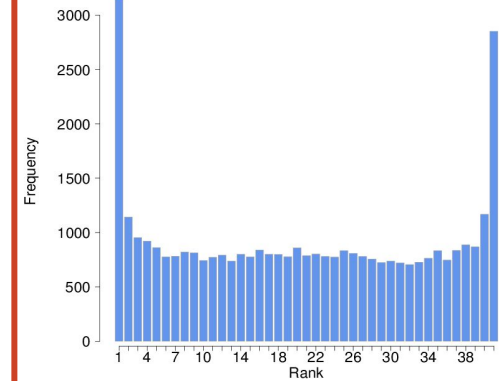
Multi-model
(ALL)



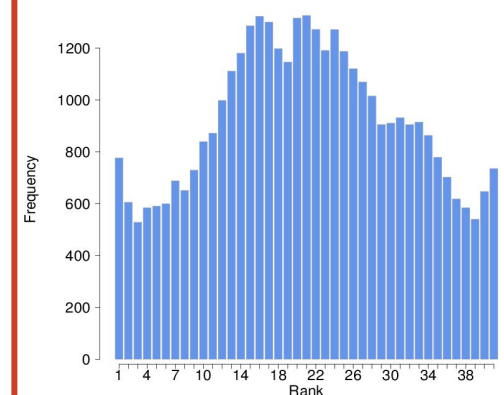
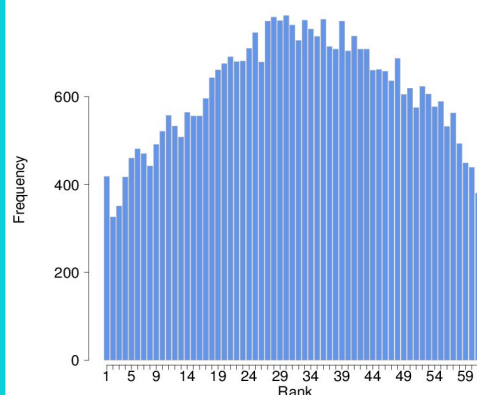
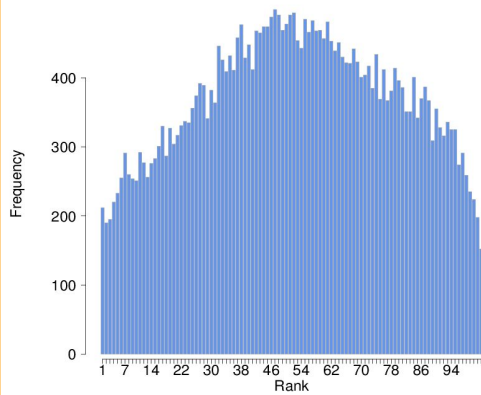
Multi-model
(ALL but NCAR)



NCAR ensemble



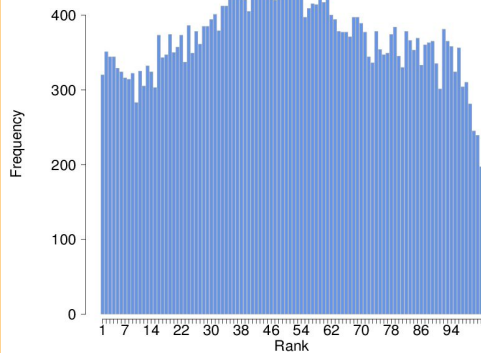
NoINIT



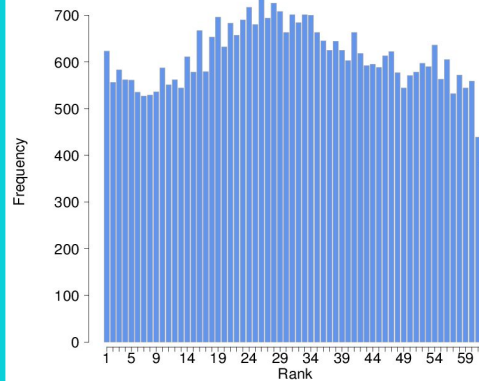
Results: surface T - Europe - f. year 1 - ANNUAL

INIT

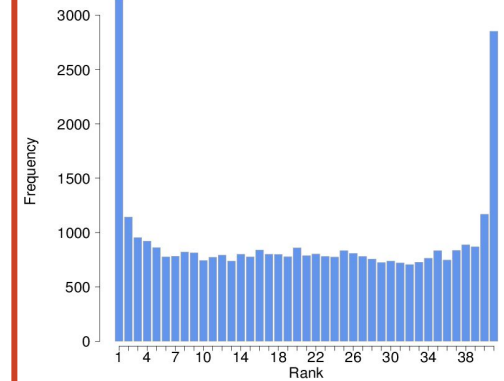
Multi-model
(ALL)



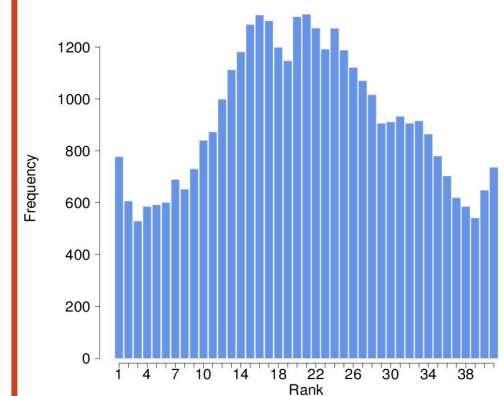
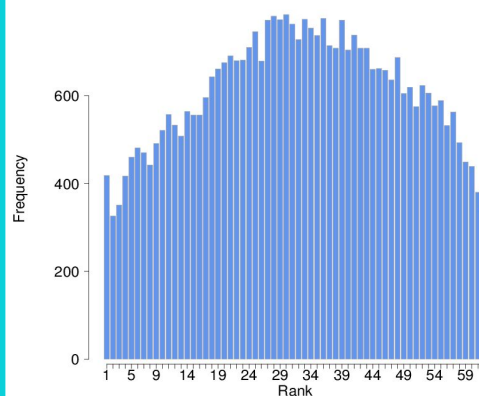
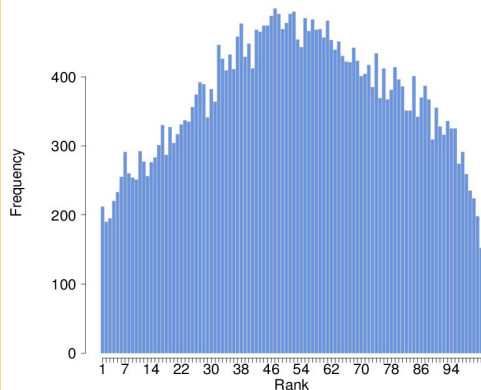
Multi-model
(ALL but NCAR)



NCAR ensemble



NoINIT



→ Not much impact from NCAR ensembles

Verfaillie et al., in prep.

Results: surface T - Europe - f. year 1 - SEASONAL

Multi-model
(ALL)

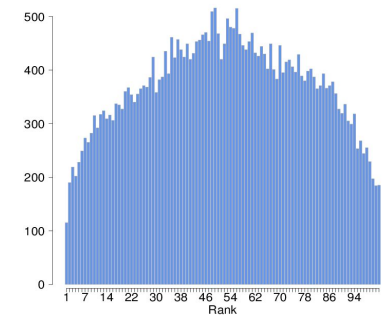
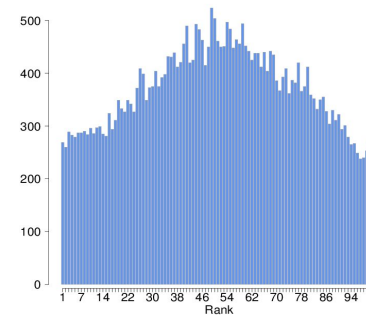
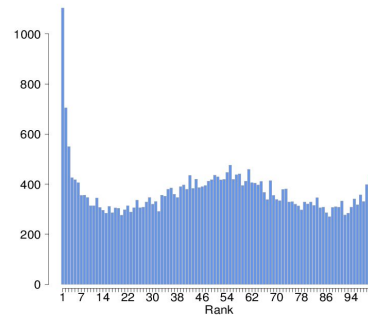
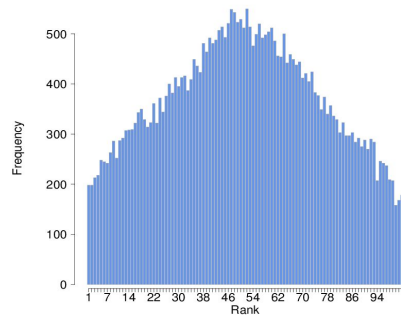
DJF

MAM

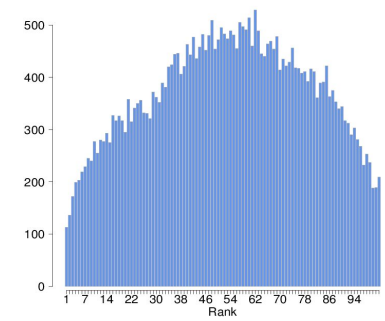
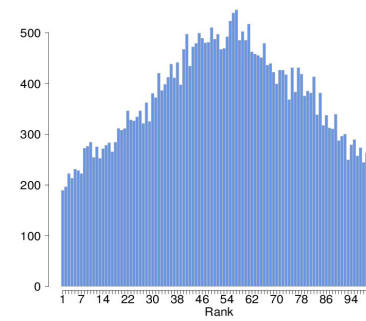
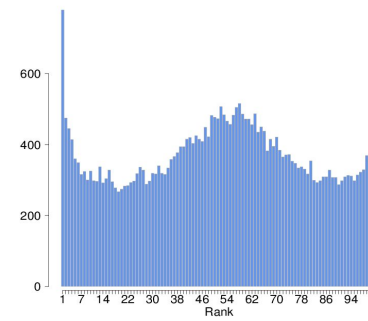
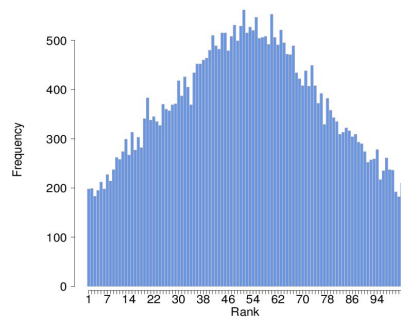
JJA

SON

INIT



NoINIT



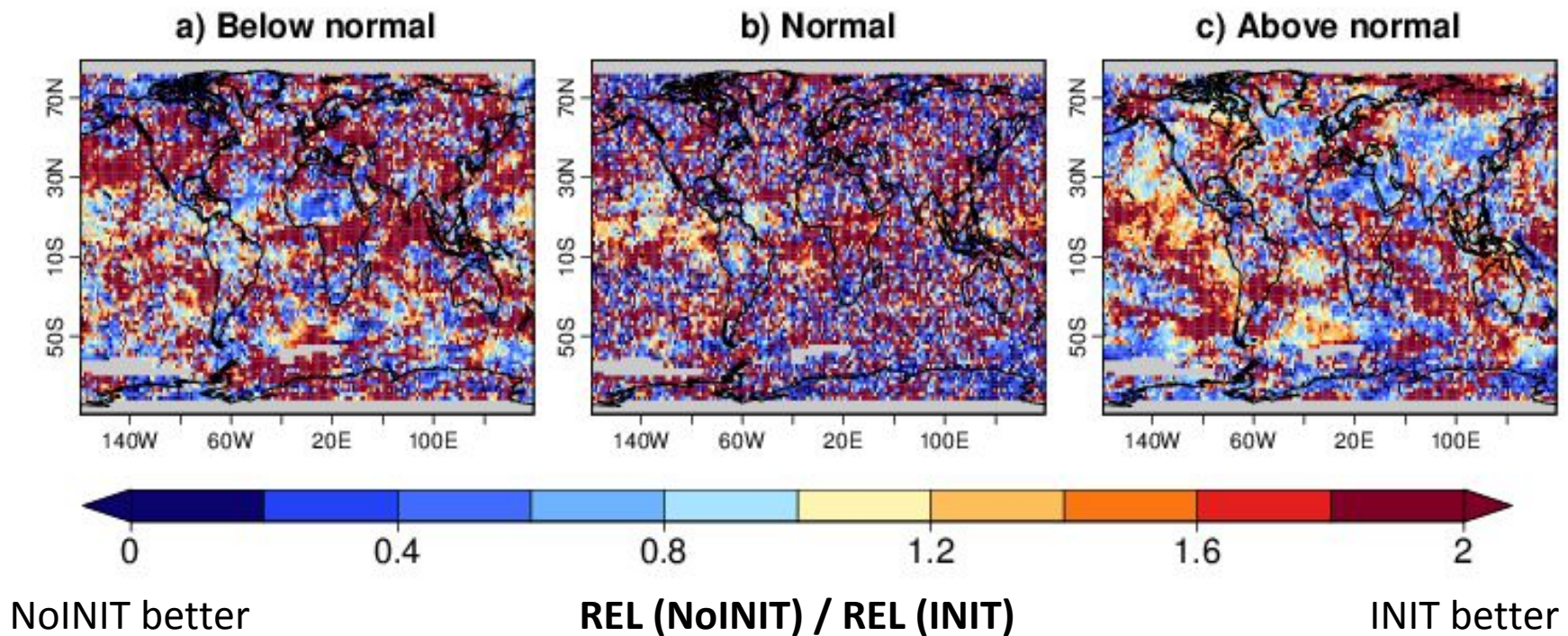
→ Similar for most seasons, except MAM

Verfaillie et al., in prep.

Results: what about other regions?

Surface T - f. years 1-5 - SON season

→ Yellow - Red = INIT more reliable than NoINIT



Conclusions

- From rank histograms: **INIT more reliable than NoINIT** for surface T over Europe (and f. year 1), NoINIT **overdispersive**
- Message from reliability diagrams is **different**
- **Not much impact** from the 40-member NCAR ensembles
- Reliability varies across **seasons**
- Added-value of INIT vs. NoINIT varies depending on **region**

Perspectives

- Work in progress: analysis of **other variables** (precipitation, sea-level pressure) and **indices** (AMV, GMT), for **other regions**, and **evolution across forecast times**
- Future work: **CMIP6** models, INIT-NoINIT **merging** methods

Thanks

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